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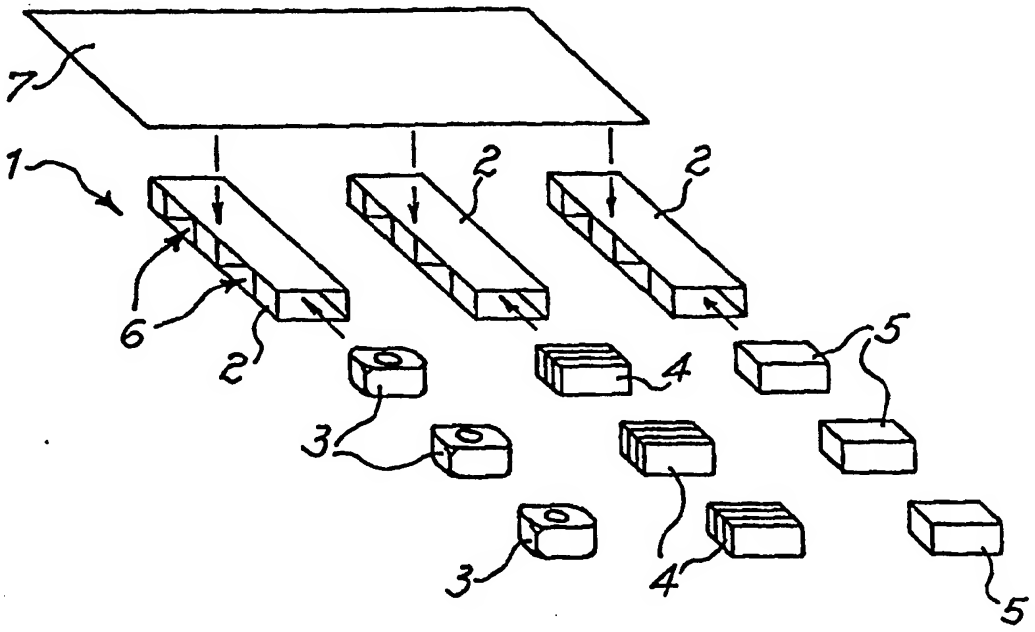
(54) Title: LOAD SUPPORT SYSTEM AND METHOD AND MACHINE FOR THE PRODUCTION THEREOF

(57) Abstract

A pallet-type support for the movement of loads, characterized in that it comprises at least one supporting leg or element in the form of a tubular shell (2) containing inner structure-reinforcing elements (3-5) for said tubular shell, spaced from each other by a pre-set distance and alternated with two or more through cavities (6) to house the forks of elevator devices, said tubular shell and reinforcing elements being made from the same type of material.



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Load support system and method and machine for the production thereof.

Technical Field

The present invention relates to a support for the movement of loads, and to a method and a machine for the manufacture thereof.

Background art

Supports for the movement of loads, currently known as "pallets, consist of a load platform resting on supporting legs or elements which are separated so as to define a free space into which may be introduced the lifting forks of elevator trucks may be introduced in order to move the pallets.

Pallets have been built from wood for a long time, but, because of disposal problems deriving from their use, pallets have recently been proposed made from cardboard, which is more easily recycled. Such a pallet is described for instance in Patent GB-1163135, according to which the pallet comprises a load-bearing sheet of corrugated cardboard within which the supporting legs are punched. Said legs are reinforced by doubling with polystyrene inserts. Obviously, such a solution has the drawback of not being a single-material pallet, and is therefore difficult to recycle.

Another solution is described in Patent US-A-4015544,

according to which a single-material pallet in corrugated cardboard is produced by gluing two sheets of cardboard so punched to provide winglets: the glued sheets are then pressed between two matching shaped moulds to bend the winglets outwards and shape them into the supporting legs or elements. The obvious drawback of this solution is the weakness of the legs obtained by this method.

The European Application No 0496199, in the name of the Applicant, describes a pallet in corrugated cardboard formed by gluing together two sheets of corrugated cardboard with the directions of the corrugations perpendicular to one another. The supporting legs or elements are formed by winglets bent downwards and strengthened by reinforcement with corrugated cardboard boxes.

Although this embodiment solves the problem of supporting the load and is disposable through recycling, the cost is still not altogether competitive with the traditional wooden pallets, also in relation to the costs of the machinery needed to produce it.

Disclosure of the invention

An object of the present invention is to avoid the aforementioned drawbacks by means of a support for loads, or pallet, which is produced from cardboard, has the required rigidity and load-bearing qualities and is

economical to produce.

A further object of the present invention is to provide a simple and economical method and machine for the production of such a pallet.

These objects are achieved by the present invention, which relates to a support for the movement of loads, or pallet, characterized according to Claim 1.

The invention relates further to a method for producing the support for the movement of loads, or pallet, characterized according to Claim 9.

The invention also relates to a machine for producing cardboard supports or pallets as above stated and actuating said mathod, according to claim 12.

According to a preferred aspect of the invention, the support is produced from a single type of material, which is preferably cardboard. In particular, the tubular shell should be in corrugated cardboard, the reinforcing elements in alveolar or honeycomb cardboard, corrugated cardboard boxes or, preferably, compact card or board, i.e. that material which is usally used to make the cores of reels of cardboard, cardboard cartons for detergents or similar strùctures.

The supporting legs or elements can be attached or not to a further planar element which constitutes the surface for receiving the load. Such element is preferably made from

a cardboard material and is obtained from a single sheet of cardboard or by two or more sheets joined together. According to a further aspect of the invention, the surface receiving the load may be the upper surface of the same tubular shell.

The support according to the present invention presents numerous advantages compared to similar supports already known in the art, in particular when compared with those made from cardboard or cardboard material.

The presence of a continuous bottom wall, which constitutes the base of the pallet, allows a plurality of pallets to be stacked and stocked on an "L"-shaped roller-way. Furthermore, the pallet structure is stronger and more rigid than that of similar pallets in corrugated cardboard. A further advantage derives from the flexibility of the structure according to the invention. In fact, the number of supporting legs or elements, formed by the tubular bodies, is selected on the basis of the size of the load for which the pallet is designed. Similarly, the distance between the supporting legs or elements, providing always that standard gaps are respected, is selected on the basis of the load, in order to distribute the weight evenly across the said supporting legs or elements.

Another advantage lies in the smaller quantity of

cardboard as required to make the pallet, corresponding to a saving of about 0.8 - 1 sq.m. per pallet.

A further advantage is that the supporting legs or elements of the pallet according to the invention, in particular those in corrugated cardboard, are fabricated on smaller (and so less expensive) machines than those required for the manufacture of the pallets according to the known state of the art as above described.

Best mode for carrying out the invention

The invention will now be described in greater detail, with reference to the attached drawings which are given by illustrative and non-limiting purposes, in which:

- fig.1 is an exploded perspective view of a preferred embodiment of the pallet according to the invention.
- fig.2 is exploded view of another version of the support according to the invention, with a flat load.
- fig.3 is a side-view of a support formed according to the embodiment of fig.1.
- figs. 4 and 5 are schemes for the assembly of two different supports according to the invention.
- fig. 6 is a diagrammatic view showing the main operating steps of a machine according to the invention for obtaining a pallet substantially according to the method of fig. 4.
- fig. 7 is a diagrammatical sectional view of a device

for picking up and placing tubular reinforcing elements into supporting legs during the formation thereof.

Supports for the movement of loads, of the pallet type, according to the present invention, comprise at least one supporting leg or element 1 formed by a tubular structure 2 of square section, innerly housing reinforcing elements 3 - 5 spaced from each other and alternating with free spaces 6 which serve to take the forks of the elevator trucks which move the pallet. In the embodiment of fig.1 there are three supporting legs or elements 1 which are attached, e.g. by means of adhesive, to a flat element 7 which serves as a load-bearing surface for the load (not shown). The flat element 7 is advantageously built from corrugated cardboard or similar material.

The supporting legs or elements 1 are spaced and parallel to each other, so that the corresponding through cavities 6 are aligned to allow the lifting forks of the elevator trucks to enter. As mentioned above, the distance between the supporting legs or elements 1 may be varied depending on the size of the load. In other words, the supporting legs or elements 1 can be positioned so that the load is evenly distributed over the legs 1 and not carried by the flat surface 7 alone.

The pallet according to the invention is of the single-material type and is preferably constructed of cardboard

material. In particular, the reinforcing elements 3 are made with the same type of cardboard material used for the tubes which form the cores of rolls of printing paper. This material is known as compact paper and is produced by winding and gluing successive layers of high-strength paper round a mandrel. Examples of products obtained using compact paper are the drums for detergent. In general, the reinforcing elements 3 are rectangular in section with rounded corners.

The reinforcing elements 4 and 5 are shown to illustrate other possible embodiments of the same, but preferably each pallet will have all reinforcing elements of the same type. In the case shown in figs. 1 and 2, the elements 4 and 5 are respectively alveolar- or honeycomb-, and box-type.

Another particularly advantageous shape of said reinforcing elements is the cylindrical shape or the tubular one, when said cylinders or tubes are placed with their axes in a vertical direction within said legs 1.

Fig.3 shows a longitudinal side-view of the pallet of fig.1, where the individual supporting legs or elements 1 are seen to be attached to the load-bearing flat surface 7 and separated to form spaces 8 for the introduction of the lifting forks of the elevator trucks, similar to the through cavities 6 of the rectangular tubes. The pallet

thus formed is of a type with a flat surface and four bays, with supporting legs or elements 1 which function as longitudinal or transverse beams according to their position.

Fig. 2 shows an embodiment of the support according to the invention in which the load-bearing flat surface 7 is absent. In fact, in this case the load 9 is formed by a plurality of sheets of cardboard, the lowest of which performs the function of the surface 7 and is preferably glued to the supporting legs or elements 1.

The tubular shell 2 of the supporting leg or element 1 is preferably produced in a single piece from a sheet in which the means of obtaining the through cavities 6 has been pre-cut. Said means is usually a hole or, as in the preferred embodiments shown in figs. 1 - 5, a "H"-shaped incision, which form four pairs of symmetrical winglets 10 which are folded inwards into the tube 2.

A method for the production of the support according to the present invention is shown schematically in fig. 4, where the main phases of the method are illustrated.

Initially, (phase A) a sheet of corrugated cardboard or similar suitable material is cut and folded to form the tube 2 of a supporting leg or element. The cut-lines 11 and the fold-lines 12 define respectively the winglets 10, a base wall 13, two shoulders or side-walls 14 and two

upper edges 15.

Then, (phase B) adhesive is applied to at least a part of the base 13 and the upper edges 15. The sheet is next folded along the lines 12 which define the base 13 (phase C); the structure-reinforcing elements 3, 4 or 5 are then attached (phase D) and the winglets 10 are bent inwards into the partially formed tube 2 (phase E); the upper edges 15 are finally folded and glued to each other (phases F and G) to complete the formation of the supporting leg or element 1, which is afterwards attached or not to the flat surface 7 to receive the load, according to necessity.

Fig. 5 shows a schematic representation of the production of a support according to the present invention in which the upper edges perform the function of the flat surface 7 to receive the load. As it can be seen, the various phases are repetitions of those of fig. 4, with the exception of phase D, where a greater number of structure-reinforcing elements 3, 4 or 5 are attached to the base 13, separated from each other but still producing a four-bay pallet, which has two flat surfaces, i.e. the surface 13 and that formed by gluing together the edges 15. The latter can operate as a flat surface to receive the load, whereas in the in the preferred embodiment shown in fig.4, this function is performed by the sheet 7.

Fig. 6 diagrammatically shows the main steps as carried out by a machine according to the invention for carrying out a pallet substantially following the method of fig. 4. The machine takes from a store a sheet 20 (fig. 6a) of corrugated cardboard or the like, substantially rectangular in shape and having two (or more) rectangular holes 21 and two (or more) C shaped cuts in order to form the openings for the lift truck fork. Moreover, the sheet 20 has pre-formed folding lines (not shown). Of course, the sheets 20 can be provided with sizes within a given but large range and the openings for the forks can be in a different number, but, if the pallet is small, no fork opening is foreseen.

In a first working station, the sheet 20 is pre-folded (fig. 6b) by a cental pressing element 22 and side folding plates 23. Moreover, when the sheet is moved to the next station, suitable glue strips and points are applied to the inner surface thereof. It is to be pointed out that, according to a feature of the invention, two different types of glue are applied, i.e. a very rapid glue (for instance a so called "hot melt" one) and a glue having a longer attaching time but a stronger action (for instance a vinylic glue). This allows to operate the machine at a very high speed because the hot-melt glue maintains the sheet parts in their glued position until the vinylic glue

may operate. According to what above, the hot-melt glue is applied in places where a rapid gluing action is required during the machine operation, and the vinylic glue is applied where a long term and strong gluing action is required.

In a second working station (fig. 6c) the pre-folded sheet 20 receives the reinforcing elements 24 having a tubular form, said elements 24 being taken by a special device as will be shown in fig. 7 and placed on the sheet 20 at pre-fixed positions and spacings, in a direction perpendicular to that of the drawing. In the same station, the sheet 20 is further folded around the reinforcing elements 24 and the wings defined by the cuts 22 are folded in the space between the reinforcing elements in order to form the openings for the lift truck forks and reinforce the structure in these locations.

In a third working station (fig. 6d), the sheet 20 is closed in a tubular form by the contemporary action of an upper pressure element 25 and side plates 26, said closure being made stable by glue applied on the wing 27 (fig. 6c) during the movement between the second and the third station, the glue being always of two types, as above stated.

Finally, a fourth working station (fig. 6d) operates to glue the tubular element just formed to the surface of a

panel or sheet 29 forming the pallet surface carrying the load. To this end, on the upper surface 28 of the tubular element 20 the above stated two types of glue are applied during movement of the tubular element between the third and fourth stations and the panel 29 is advanced in a direction X perpendicular to the advancing direction Y of the tubular element, the advancement of said panel 29 being controlled by an encoder or the like in order to exactly place the tubular element in a pre-set position on the panel surface. When the panel and tubular element are correctly placed, pressure means act on said elements in a vertical direction to allow them to glue.

The panel 29 usually carries more than one tubular element 20, the further elements being applied in the same way, as diagrammatically shown in fig. 6d'.

Figure 7 shows a picking up device 30 for the reinforcing tubular elements 24, which are placed in a store with their axis in a vertical position. Each device 30 comprises a cylindrical portion 31 having a diameter lesser than the inner diameter of the tubular reinforcing elements 24 and ending with a shoulder 32 adapted to stop on the upper edge of the picked-up tubular element at the end of the insertion therein. The cylindrical portion 31 is then upwardly moved toward the shoulder 32, for instance by a pneumatic control, in such a manner that a

plurality of outer strips 33, for instance in plastic material, are forced toward the inner surface of the tubular reinforcing element (see fig. 7, right side drawing) in order to retain and allow to picking up from the store and place the same in the required position on the sheet 20 (see fig. 6c). The pneumatic control is then released, in such a manner that the cylindrucal portion may resume its starting position, for instance due to resilient means, and make the tubular reinforcing element free on the sheet 20, wherein it is retaind by the hot-melt glue.

CLAIMS

1. A pallet-type support for moving loads, characterized in that it comprises at least one supporting leg or element formed by a tubular shell containing inner structure-reinforcing elements for the same tubular shell, said structure-reinforcing elements being spaced from each other by a pre-set path, and being alternated with two or more through cavities to house the forks of elevator devices.

2. A support according to Claim 1, characterized in that it comprises a plurality of parallel and separated supporting legs or elements, the corresponding through cavities of said legs being aligned.

3. A support according to Claim 1 or 2, characterized in that said supporting legs or elements are attached to a surface adapted to receive the load.

4. A support according to Claim 1, characterized in that a portion of said tubular shell forms the surface to receive the load.

5. A support according to one of the preceding Claims, characterized in that said tubular shell is produced in a single piece.

6. A support according to one of the preceding Claims, characterized in that it is made from a single material.

7. A support according to Claim 6, characterized in that

it is made from a cardboard material.

8. A support according to Claim 7, characterized in that said reinforcing elements are tubular elements made from paper or compact cardboard.

9. A method for the production of a pallet-type support according to one of Claims 1 to 8, characterized in that it comprises the following steps: die-cutting and folding a sheet of cardboard or similar material, cutting at least two pairs of folding winglets as well as a plurality of fold-lines which define at least one base wall, two side walls and two upper folding edges;

applying an adhesive to at least a part of said base and said upper edges;

positioning a plurality of reinforcing elements on the said base, attaching the same by means of said adhesive;

folding said upper edges and attaching them to each other or to said reinforcing elements; and

folding inwards said die-cut winglets to obtain bays to take the forks of elevator trucks.

10. A method according to Claim 9, characterized in that it comprises the step of folding the said shoulders along said fold-lines before attaching said reinforcing elements.

11. A method according to Claim 9 or 10, characterized by folding inwards said winglets before folding said upper

edges.

12. A machine for fabricating a pallet support according to one of claims 1 to 8 and carryng out a method according to one of claims 9 to 11, characterized in that it comprises a plurality of working stations and a transporting device between the same for operating on a sheet (20), said stations having pre-folding means for pre-folding said sheet, picking-up devices for picking-up reinforcing elements and placing the same in pre-set positions on a sheet surface, folding means for folding said sheet in a tubular shape around the reinforcing elements, attaching means for attaching two or more of said tubular shaped sheets to a load carrying panel, and glue delivering means to deliver glue spots or strips in pre-set positions on the sheet surfaces.

13. A machine according to claim 12, characterized in that said glue delivering means operate to deliver two different types of glue, i.e. a rapid action glue (hot-melt) and a slow action glue (vinylic glue).

14. A machine according to claim 12 or 13, in which tubular reinforcing elements are placed on said sheet, characterized in that said picking-up devices comprise a cylindrical portion having a diameter lesser than the inner diameter of the reinforcing elements, said cylindrical portion being controlled to reduce its axial

length in order to spread apart flexible outer strips thereof which force agaist the inner surface of the tubular reinforcing element to allow picking-up thereof.

15. A machine according to one of claims 12 to 14, characterized in that folding means are foreseen to fold pre-cut portions of said sheet in order to reinforce openings for the lift truck fork.

16. A machine according to one of claims 12 to 15, characterized in that said attaching means comprise advancing means to advance pre-set lengths of said panel in order to place zones of the same in coincidence with successively fed tubularly shaped sheets, and pressing means to connect said panel and tubularly shaped sheets by glue.

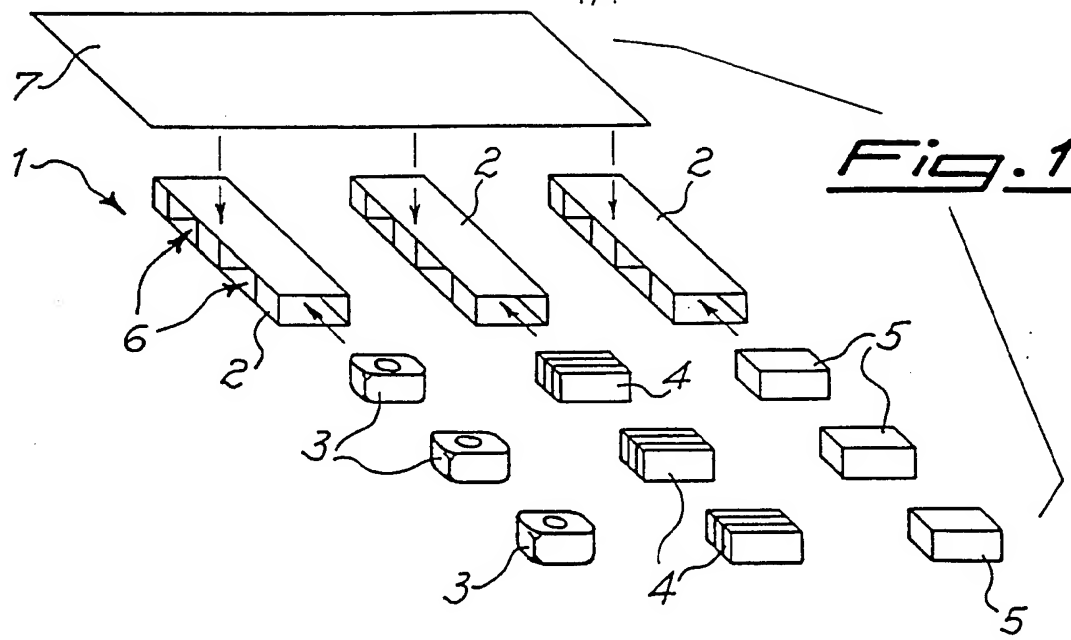


Fig.1

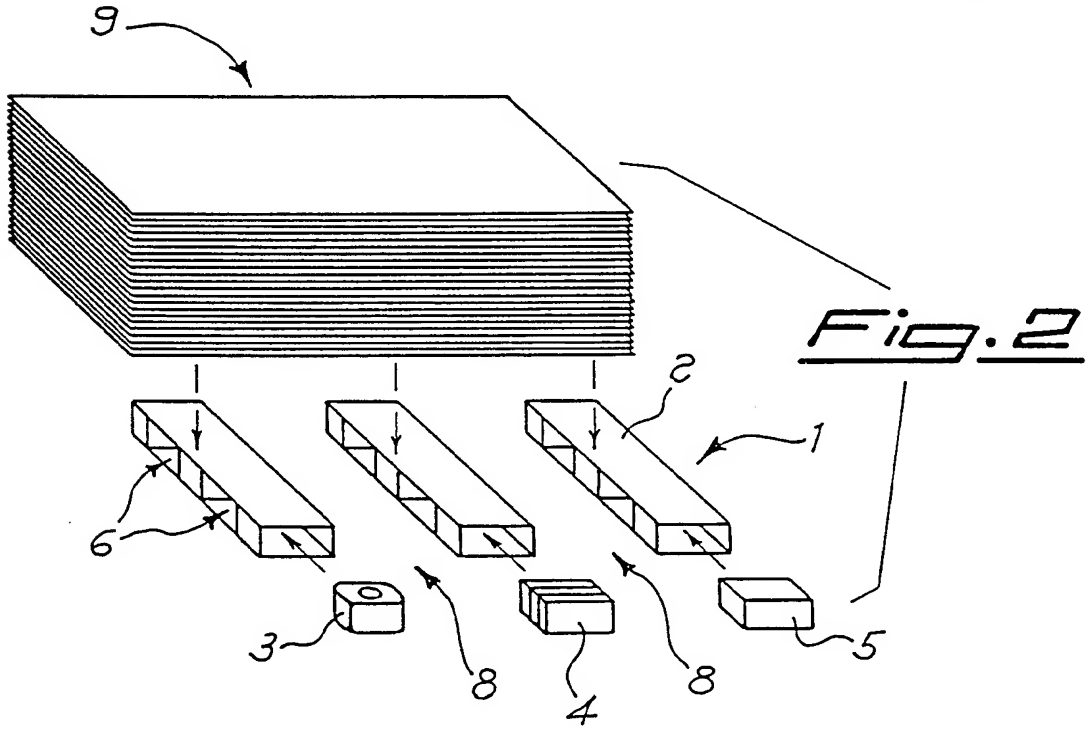
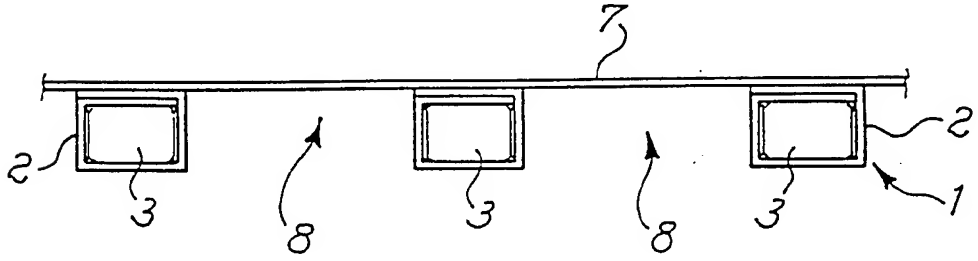


Fig.2

Fig.3



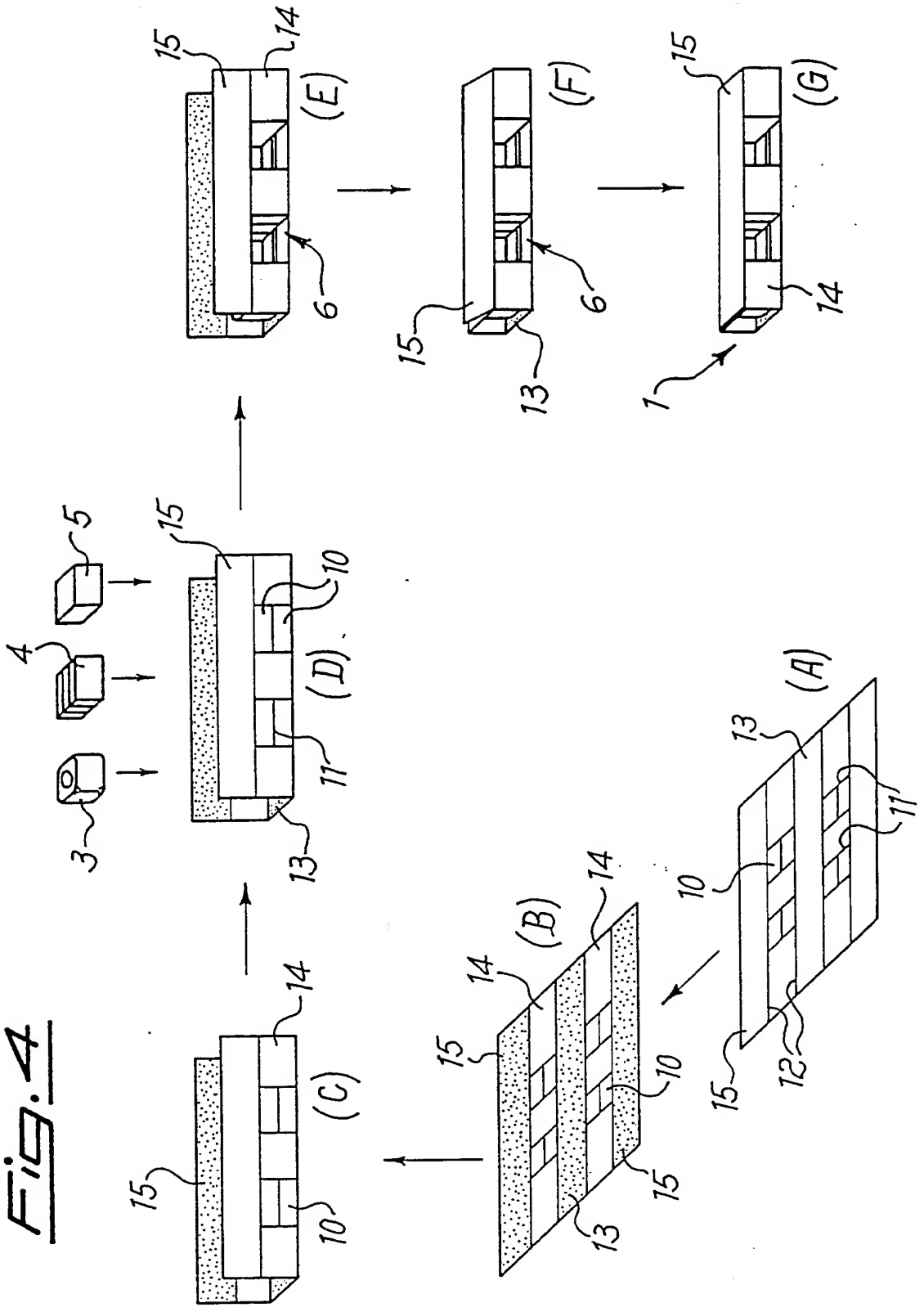


Fig.4

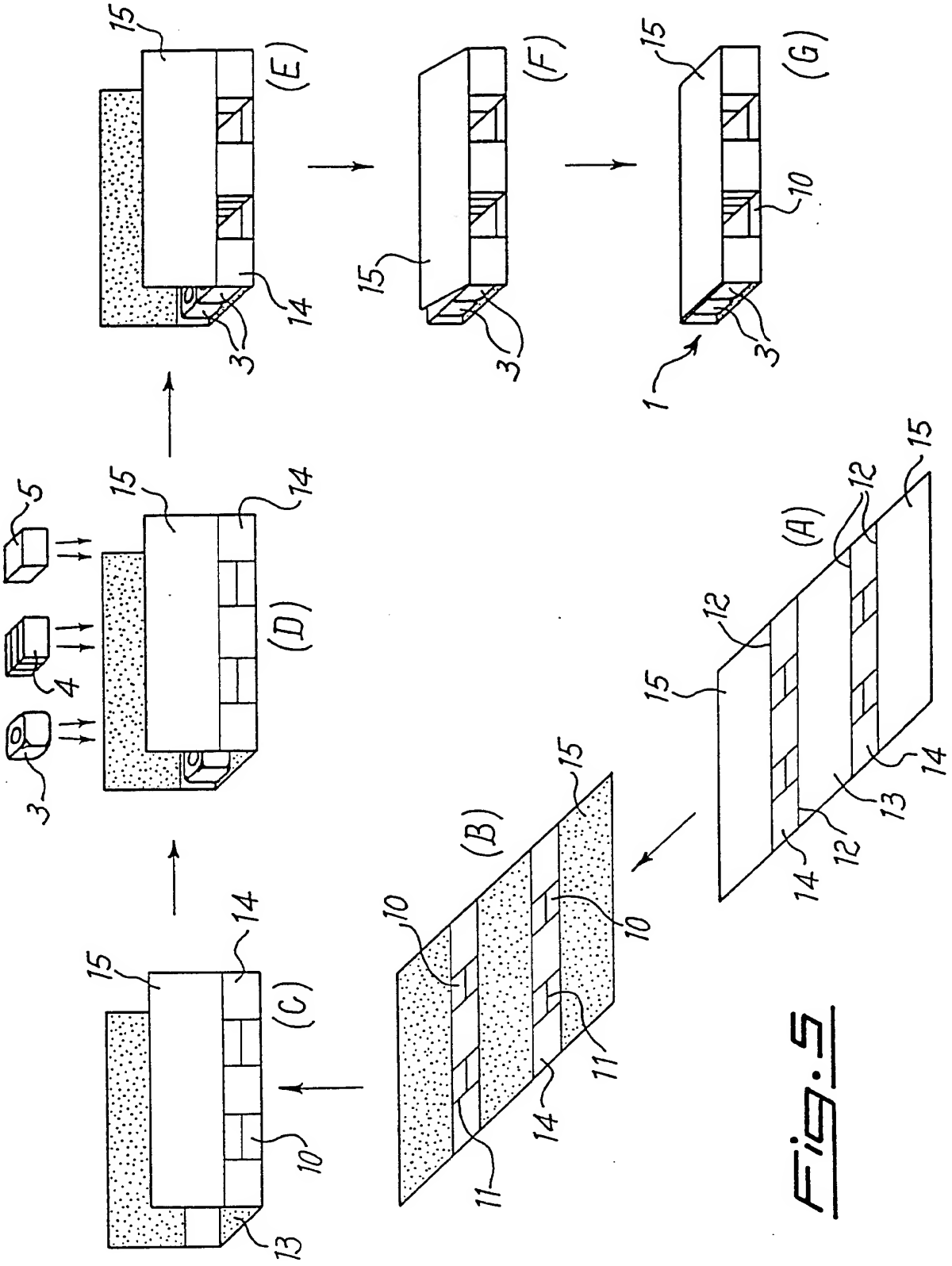


Fig. 5

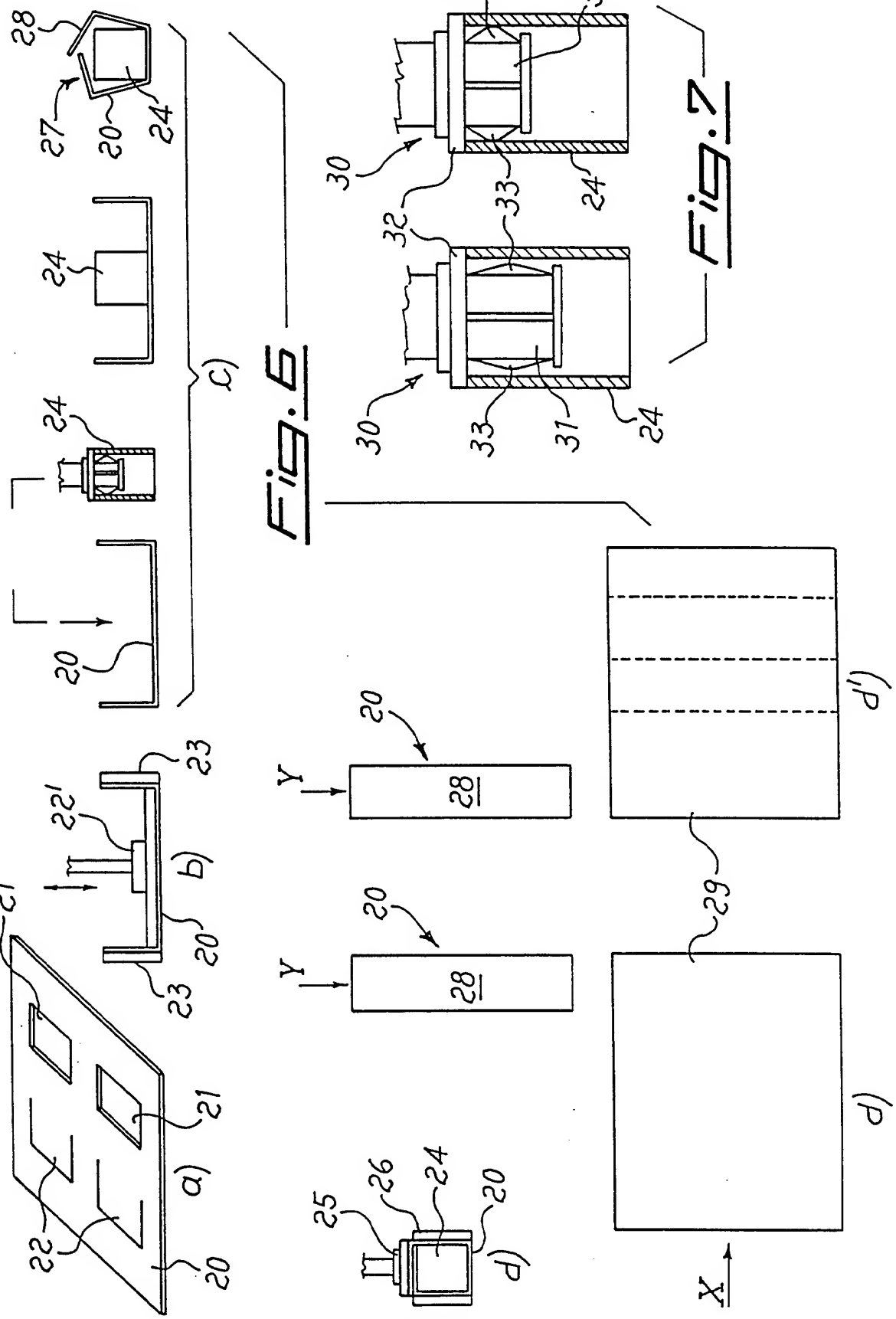


Fig. 6

Fig. 7

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D19/40 B65D19/34

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP,A,0 334 329 (CANON) 27 September 1989 see column 6, line 23 - column 8, line 41 see column 11, line 54 - column 12, line 5; figures 1,4,5,8,9	1-8 9-11
X Y	US,A,3 881 429 (SEYMORE) 6 May 1975 see the whole document	1-5 9-11
A	GB,A,930 263 (REED) 3 July 1963 see page 1, line 9 - line 22; figures	4
A	US,A,4 140 295 (DALEY) 20 February 1979 see the whole document	12
A	US,A,2 528 413 (BUDD) 31 October 1950 see column 3, line 60 - column 4, line 35; figures 5-8	12,14

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